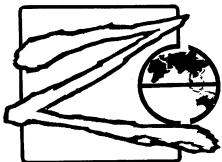


Candidate Name: _____ Index No: _____ Class: _____



**ZHENGHUA SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2022
SECONDARY FOUR EXPRESS
CHEMISTRY**

6092/01

Paper 1 Multiple Choice

13 September 2021

1 hour

Additional Materials: Multiple Choice Answer Sheet

*Zhenghua Secondary School Zhenghua Secondary School Zhenghua Secondary School Zhenghua Secondary School
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READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name, Centre number and index number on the Answer Sheet in the spaces provided.

There are **forty** questions on this paper. Answer **all** questions. For each question, there are four possible answers, **A, B, C** or **D**.

Choose the one you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 18.

The use of an approved scientific calculator is expected, where appropriate.

Name of Setter: Ms Nur Elfianie Abdul Samad

- The list gives five pairs of gases.

- In which pairs would one gas diffuse faster than the other under the same conditions of temperature and pressure?

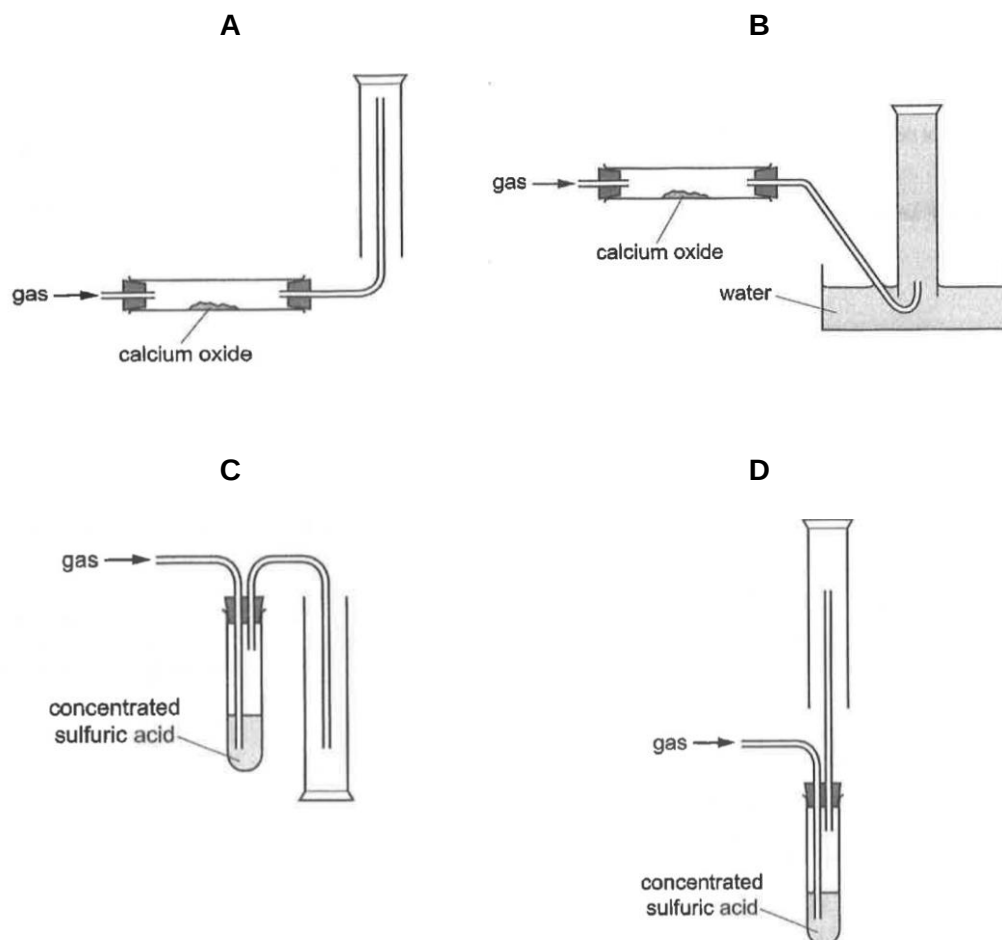
- 2** The boiling points of some substances found in air are given in the table.

substance	boiling point / °C
argon	-186
neon	-246
oxygen	-196
nitrogen	-183

- 2

- 3 A gas has no effect on both red and blue litmus papers but is soluble in water and less dense than air.

Which diagram shows the best way of drying and collecting the gas?



- 4 An aqueous solution of a salt is tested and the following results are obtained.

test	result
addition of a few drops of aqueous sodium hydroxide followed by addition of excess aqueous sodium hydroxide	white precipitate forms, then dissolves
addition of 2 cm ³ of dilute sulfuric acid	effervescences, gas turned blue litmus paper red

What ions are most likely found in the salt?

- | | |
|---|---|
| A Al^{3+} and SO_4^{2-} | B Al^{3+} , Zn^{2+} and CO_3^{2-} |
| C Al^{3+} , Zn^{2+} and SO_4^{2-} | D Zn^{2+} and CO_3^{2-} |

- 5 Element R has p protons and n neutrons in its nucleus.

Which row gives the correct number of sub-atomic particles in a negative ion of an isotope of R?

	proton	neutron	electron
A	p	$n + 1$	$p + 1$
B	p	$n - 1$	$p - 1$
C	$p + 1$	n	$p + 1$
D	$p + 1$	n	$p - 1$

- 6 Which statement(s) correctly describes the properties of mixtures of iron and sulfur and the compound iron(II) sulfide?

	mixtures of iron and sulfur	compound iron(II) sulfide
1	iron and sulfur mixed without undergoing a chemical reaction	iron and sulfur combined in a chemical reaction
2	the ratio of iron and sulfur varies	the ratio of iron and sulfur is always the same
3	properties of iron and sulfur were lost when the mixture was formed.	iron(II) sulfide has the same properties of iron and sulfur

- | | | | |
|----------|---------|----------|---------|
| A | 1 only | B | 1 and 2 |
| C | 2 and 3 | D | 3 only |

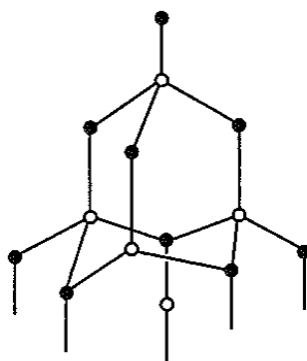
7 The following all conduct electricity.

- 1 aqueous copper(II) sulfate
- 2 copper metal
- 3 molten sodium chloride
- 4 solid graphite

Which substance(s) conduct/s electricity using free-moving electrons?

- | | |
|------------------|------------------|
| A 1 and 2 | B 2 and 3 |
| C 2 and 4 | D 3 and 4 |

8 The diagram shows a structure of a compound made of carbon and silicon atoms, $(\text{SiC})_n$.



key

○ atom of silicon

● atom of carbon

Which statement is true for $(\text{SiC})_n$?

- A** It acts as a lubricant.
- B** It conducts electricity.
- C** It is a gas at room temperature.
- D** It is insoluble in water.

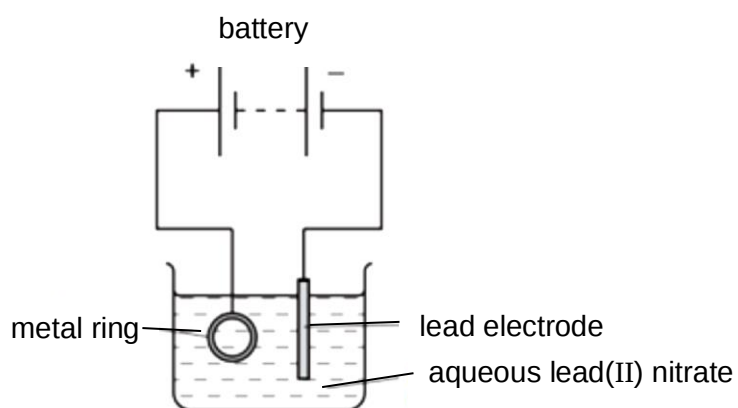
9 22 g of hydrocarbon X has a volume of 12 dm^3 at room temperature and pressure.

What is the molecular formula of X?

- | | |
|---------------------------------|---------------------------------|
| A CH_4 | B C_2H_6 |
| C C_3H_6 | D C_3H_8 |

10 Which statement about electrolysis is correct?

- A** Chemical energy is converted to electrical energy.
- B** Electrons flow through the electrolyte.
- C** Ionic compounds are broken down.
- D** Metals are formed at the positive electrode.
- 11** The diagram below shows the apparatus used to electroplate a metal ring with lead.



The electroplating was not successful.

What change must be made for it to work?

- A** Add solid lead(II) sulfate to the electrolyte.
- B** Increase the temperature of the electrolyte.
- C** Replace the lead electrode with carbon electrode.
- D** Reverse the terminals of the battery.

12 The complete combustion of ethane is an exothermic reaction.

Which statement explains this?

- A** More bonds are broken than formed.
- B** More bonds are formed than broken.
- C** The total enthalpy of the bonds broken is greater than the total enthalpy of the bonds formed.
- D** The total enthalpy of the bonds broken is less than the total enthalpy of the bonds formed.

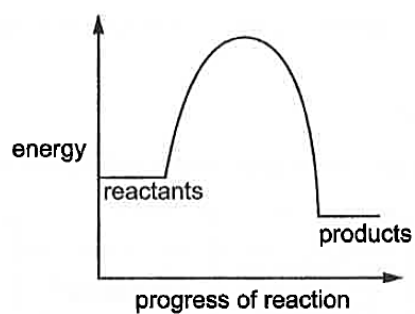
13 An equation for respiration is shown.



What can be deduced from this equation?

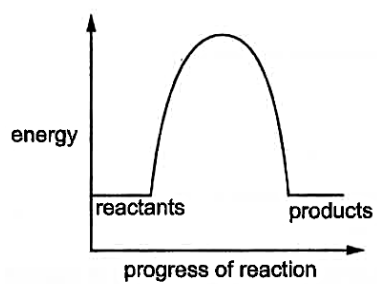
- A** Energy from the sun is needed for this reaction.
- B** Glucose is reduced.
- C** Larger molecules are made from smaller molecules.
- D** ΔH for photosynthesis is +2830 kJ/mol

- 14 The energy profile diagram for a given reaction without the use of catalyst is shown below.

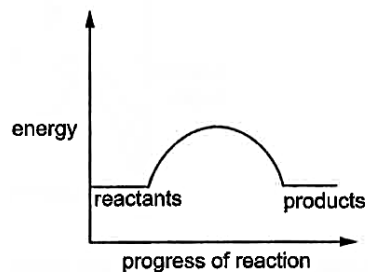


Which energy profile diagram is correct for the same reaction but using a catalyst?

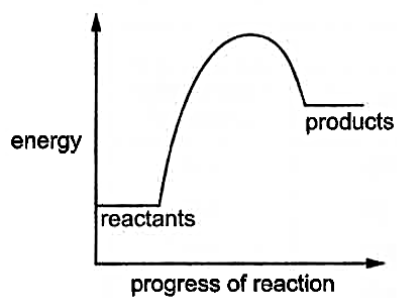
A



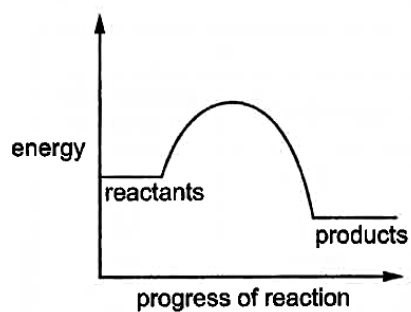
B



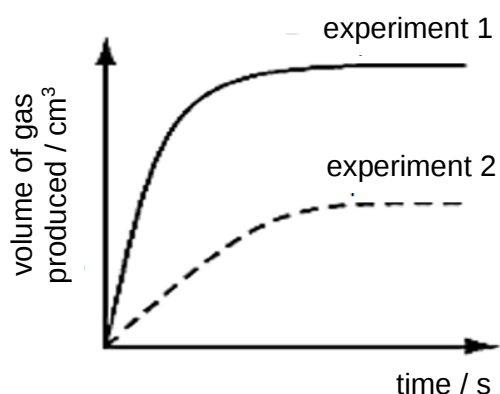
C



D



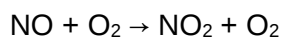
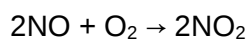
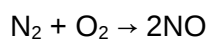
- 15** Excess calcium carbonate was reacted with 25.0 cm³ of 2 mol/dm³ of dilute hydrochloric acid at 50°C. The gas produced was collected at regular time and the results are shown below as experiment 1.



Similarly, experiment 2 was a reaction between excess calcium carbonate and dilute hydrochloric acid but the volume of gas collected in experiment 1 was twice of that in experiment 2.

What change was made to produce the graph of experiment 2?

- A** Add catalyst.
 - B** Reduce the concentration of dilute hydrochloric acid to 1 mol/dm³
 - C** Reduce the temperature of the reaction to 25°C.
 - D** Reduce the volume of dilute hydrochloric acid to 12.5 cm³
- 16** The following reactions take place during a thunderstorm.



Which row shows the correct processes undergone by the reactants?

	N ₂	NO	O ₃
A	oxidised	oxidised	oxidised
B	oxidised	oxidised	reduced
C	reduced	reduced	oxidised

D	reduced	reduced	reduced
----------	---------	---------	---------

- 17** The dissociation constant for an acid indicates the extent of dissociation into its ions. The higher the dissociation constant, the stronger the acid.

The dissociation constants of some acid and two statements are given below.

acid	dissociation constant
methanoic acid, HCO_2H	1.80×10^{-4}
ethanoic acid, $\text{CH}_3\text{CO}_2\text{H}$	1.75×10^{-5}
propanoic acid, $\text{CH}_3\text{CH}_2\text{CO}_2\text{H}$	1.34×10^{-5}
chloroethanoic acid, $\text{ClCH}_2\text{CO}_2\text{H}$	1.40×10^{-3}

statement 1: Increasing the length of the carbon chain makes the acid stronger.

statement 2: Replacing a hydrogen atom in ethanoic acid makes the acid stronger.

Based on the information above, which statement(s) is / are correct?

- A** both statements
- B** neither statement
- C** statement 1
- D** statement 2
- 18** Salt P can be prepared by reacting together:
- a dilute acid and a soluble base or
 - a soluble base and an ammonium salt

Which salt cannot be P?

- A** iron(II) chloride
- B** potassium chloride
- C** potassium nitrate
- D** sodium sulfate

19 Beryllium oxide is an amphoteric white solid.

Which substance(s) can be used to distinguish beryllium oxide from sulfur dioxide?

- 1 HCl (aq)
- 2 HNO₃ (aq)
- 3 NaOH (aq)
- 4 KOH (aq)

A 1 and 2

B 2 and 3

C 2 and 4

D 3 and 4

20 What are the uses of sulfuric acid?

- 1 making fertilisers
- 2 making detergents
- 3 Sterilising water
- 4 used in car batteries

A 1 and 2

B 1, 2 and 4

C 2 and 3

D 2, 3 and 4

21 Aqueous ethylamine has similar properties as aqueous ammonia.

Which statement is true about ethylamine?

- A** It forms an alkaline gas when heated strongly.
- B** It forms a blue precipitate with a solution of copper(II) sulfate.
- C** It forms a colourless solution with a solution of aluminium nitrate.
- D** It is insoluble in water.

- 22** Which statement does **not** correctly describe the Haber Process?
- A** A catalyst of finely divided iron is used.
 - B** A yield of 100% of ammonia is achieved when temperature of 450°C is used.
 - C** Nitrogen and hydrogen are fed into the reactor based on the ratio of 1:3.
 - D** To reduce cost due to high pressure technology, the reaction is carried out at a more economical pressure of 200 atm.
- 23** Some properties of elements in the same group of the Periodic Table are listed.
- 1 charge on the ion
 - 2 number of electron shell
 - 3 number of protons
 - 4 total number of inner shell electrons

Which property shows an increase as the group is descended?

- A** 1 and 2
 - B** 1 and 3
 - C** 2 and 4
 - D** 3 and 4
- 24** The element Astatine is below Iodine in Group VII of the Periodic Table.
- Which statement describes astatine correctly?
- A** It forms covalent molecules with sodium metal.
 - B** It is a weaker oxidising agent than iodine.
 - C** It has high melting point due to the strong covalent bonds between astatine atoms.
 - D** It has a lower density than iodine.

- 25** An oxide of metal J increases the rate of decomposition of hydrogen peroxide. At the end of the reaction, oxide of J is chemically unchanged.

Which row correctly describes metal J?

	proton number	mass number
A	18	40
B	20	40
C	25	55
D	53	127

- 26** Which statements about metals are correct?

- 1 All metals are good at conducting thermal energy.
- 2 All metals react with oxygen to form basic oxides.
- 3 Some metals have more than one oxidation states.

- A** 1 and 2 only **B** 1 and 3 only
C 2 and 3 only **D** 1, 2 and 3

- 27** Which statement about steel is correct?

- A** Steel does not conduct electricity as well as pure metals.
B Steel has a chemical formula.
C Steel is formed by a chemical reaction.
D The structure of steel contain a 'sea of electrons'

- 28 Pieces of lead, magnesium, iron and a metal X were placed in separate test tubes containing aqueous solutions of their ions.

The following observations were made.

metal	metal ion			
	Pb^{2+}	Mg^{2+}	Fe^{2+}	X^{2+}
Pb	✗	✗	✗	✗
Mg	✓	✗	✓	✓
Fe	✓	✗	✗	✓
X	✓	✗	✗	✗

key

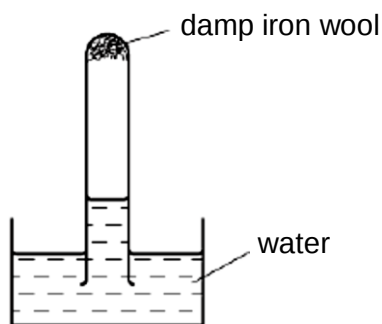
✓ = reaction occurs

✗ = reaction does not occur

- Which is the correct order of reactivity of the metals, starting from the most reactive to the least?
- A Fe, Mg, Pb, X
- B Fe, X, Pb, Mg
- C Mg, Fe, X, Pb
- D Pb, Fe, X, Mg
- 29 Which reaction is **not** a step in the production of iron from haematite in the blast furnace?

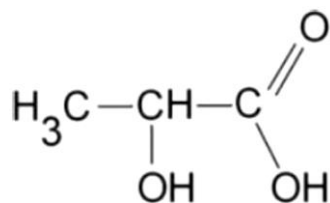
- A coke burning in the air to produce carbon dioxide
- B carbon reacting with carbon dioxide to produce carbon monoxide
- C iron(III) oxide reacting with carbon monoxide to produce iron
- D iron reacting with limestone to produce slag

- 30 A test tube containing some damp iron wool was inverted in water. After three days, the water inside the test tube has risen.



- Which statement explains the rise in water?
- A Iron(III) oxide was formed.
 - B Oxygen gas had dissolved in water.
 - C The iron wool was reduced.
 - D The temperature of the water had increased.
- 31 Which statement about the fractional distillation of petroleum is true?
- A At each level in the fractionating column, only one type of hydrocarbon is collected.
 - B Temperatures are higher at the top of the fractionating column than at the bottom.
 - C The hydrocarbons collected at the top of the fractionating column have high viscosity.
 - D The hydrocarbons collected at the top of the fractionating column have the smallest molecular mass.
- 32 Which substance could **not** be produced when methane reacts with chlorine in the presence of ultra violet light?
- A chloromethane
 - B hydrogen
 - C hydrogen chloride
 - D tetrachloromethane

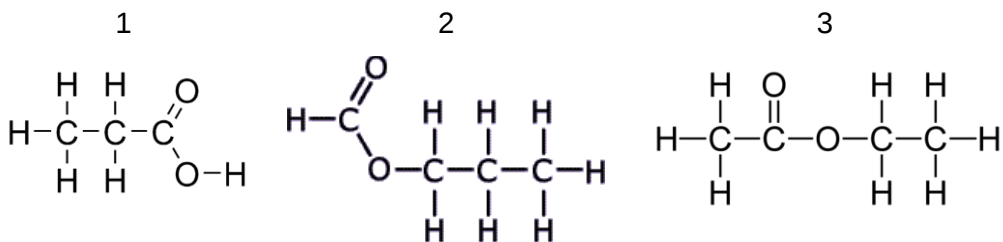
33 The structural formula of 2-hydroxyl propanoic acid is shown below.



Which reaction can take place with 2-hydroxyl propanoic acid?

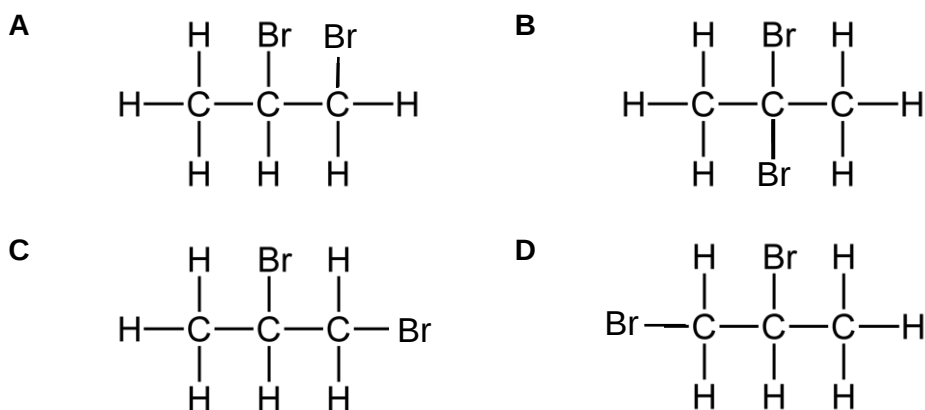
- A** It decolourises aqueous bromine.
- B** It dissociates in water to produce hydroxide ions.
- C** It produces ammonia gas with ammonium nitrate.
- D** It undergoes condensation polymerisation.

34 Which of the compounds below are isomers of each other?



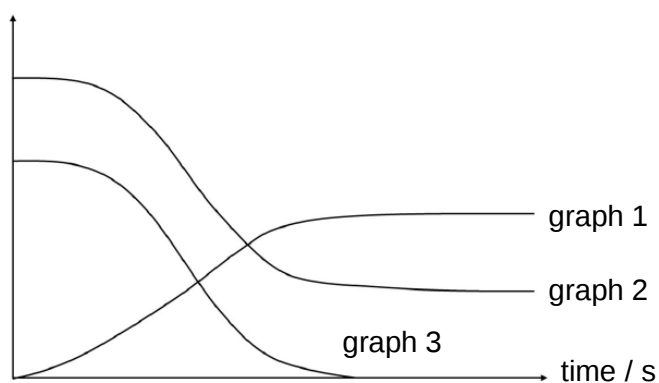
- A** 1 and 2 only **B** 1 and 3 only
C 2 and 3 only **D** 1, 2, and 3

35 Which is the product for the reaction between propene and bromine?



- | | | | |
|----------|-----|----------|-----|
| A | 3.0 | B | 4.5 |
| C | 5.0 | D | 8.0 |

- amount of substance



	graph 1	graph 2	graph 3
A	ethanol	yeast	glucose
B	glucose	yeast	ethanol
C	glucose	ethanol	yeast
D	ethanol	glucose	yeast

- A** carbon monoxide
B nitrogen dioxide
C sulfuric acid
D unburnt hydrocarbon

- 39** The air in four cities were collected and analysed. The concentration of three gases in parts per million (ppm) in the air samples are shown below.

city	concentration of carbon monoxide / ppm	concentration of carbon dioxide / ppm	concentration of nitrogen dioxide / ppm
Taxila	48	23	36
Skara Bae	44	35	47
Troy	38	50	22
Sanchi	20	44	59

In which city will the problem of acid rain be reduced if all vehicles are fitted for catalytic converters?

- | | | | |
|----------|--------|----------|-----------|
| A | Sanchi | B | Skara Bae |
| C | Taxila | D | Troy |

- 40** Which atmospheric pollutant can be removed by the process of reduction?

- A** Carbon monoxide in catalytic converter
- B** Nitrogen dioxide in acid rain by reaction with calcium carbonate
- C** Nitrogen oxide in catalytic converter
- D** Sulfur dioxide by flue gas by reaction with calcium carbonate

End – Of – Paper

Group																	
I	II							III	IV	V	VI	VII	0				
Key proton (atomic) number atomic symbol name relative atomic mass 1Hhydrogen1																	
3Li lithium 7	4Be beryllium 9																
11Na sodium 23	12Mg magnesium 24	21Sc scandium 45	22Ti titanium 48	23V vanadium 51	24Cr chromium 52	25Mn manganese 55	26Fe iron 56	27Co cobalt 59	28Ni nickel 59	29Cu copper 64	30Zn zinc 65	31Ga gallium 70	32Ge germanium 73	33As arsenic 75	34Se selenium 79	35Br bromine 80	36Kr krypton 84
37Rb rubidium 85	38Sr strontium 88	39Y yttrium 89	40Zr zirconium 91	41Nb niobium 93	42Mo molybdenum 96	43Tc technetium -	44Ru ruthenium 101	45Rh rhodium 103	46Pd palladium 106	47Ag silver 108	48Cd cadmium 112	49In indium 115	50Sn tin 119	51Sb antimony 122	52Te tellurium 128	53I iodine 127	54Xe xenon 131
55Cs caesium 133	56Ba barium 137	57-71lanthanoids	72Hf hafnium 178	73Ta tantalum 181	74W tungsten 184	75Re rhenium 186	76Os osmium 190	77Ir iridium 192	78Pt platinum 195	79Au gold 197	80Hg mercury 201	81Tl thallium 204	82Pb lead 207	83Bi bismuth 209	84Po polonium -	85At astatine -	86Rn radon -
87Fr francium -	88Ra radium -	89-103actinoids	104Rf Rutherfordium -	105Db dubnium -	106Sg seaborgium -	107Bh bohrium -	108Hs hassium -	109Mt meitnerium -	110Ds darmstadtium -	111Rg roentgenium -	112Cn copernicium -	114Fl flerovium -	114	116Lv livermorium -	116	-	-

57	La	lanthanum	139	58	Ce	cerium	140	59	Pr	praseodymium	141	60	Nd	neodymium	144	61	Pm	promethium	–	62	Sm	samarium	150	63	Eu	euporium	152	64	Gd	gadolinium	157	65	Tb	terbium	159	66	Dy	dysprosium	163	67	Ho	holmium	165	68	Er	erbium	167	69	Tm	thulium	169	70	Yb	ytterbium	173	71	Lu	lutetium	175
89	Ac	actinium	–	90	Th	thorium	232	91	Pa	protactinium	231	92	U	uranium	238	93	Np	neptunium	–	94	Pu	plutonium	–	95	Am	americium	–	96	Cm	curium	–	97	Bk	berkelium	–	98	Cf	californium	–	99	Es	einsteinium	–	100	Fm	fermium	–	101	Md	merdelevium	–	102	No	nobelium	–	103	Lr	lawrencium	–

89	Ac	actinium	232	90	Th	thorium	232	91	Pa	protactinium	231	92	U	uranium	238	93	Np	neptunium	237	94	Pu	plutonium	239	95	Am	americium	243	96	Cm	curium	247	97	Bk	berkelium	247	98	Cf	californium	251	99	Es	einsteinium	252	100	Fm	fermium	257	101	Md	merendelevium	258	102	No	nobelium	259	103	Lr	lawrencium	262
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